Impacts of Climate-induced Changes in Plant Phenology on Migration, Breeding, and Redistribution of subArctic- and Arctic-nesting Avifauna

Principal Contact : David H. Ward, Wetlands and Terrestrial Ecology Branch, Alaska Science Center, Anchorage, Alaska

Summary: There is considerable evidence that global climate change has altered the start of spring vegetative growth or green-up and extended the growing season in plants at northern latitudes. What is not clear is whether migratory birds have adapted to these shifts in plant phenology by modifying the timing of migration and nesting. We propose to examine whether there is evidence for long-term changes in phenology of spring vegetative green-up has changed during the past 23-years in Alaska, and, if so, whether arctic and subarctic avian migrants have altered timing of migration or reproduction correspondingly. Failure to adapt to changes in plant phenology associated with climate change may put populations at risk because key northern wildlife events occur during periods of peak resource abundance.

Our approach for this project is to assess historical and future changes in plant phenology relative to major climate drivers, and determine if the timing of spring green-up is synchronized across breeding areas or if the process has become fractured, potentially disrupting the timing of bird migration and breeding and putting species at risk. We will use a time-series of NDVI (normalized difference vegetation index) composites developed from historical satellite imagery (1985-2009) to derive vegetation phenology metrics. These metrics can then be related to long-term data records on bird migration and breeding taken across Alaska. Projections of how climate will affect habitats in the future will be made by linking our mapped phenology metrics for the major habitats of Alaska with down-scaled climate models.

This research will generate publications and a series of maps of past (1985-2009) and future (2009-2099) variability in phenology across major habitats of Alaska. These maps will be accompanied by a trend analysis that illustrates the effects of these trends on migratory bird behavior across biomes. Alaska land managers can use the maps and down-scaled climate projections of habitat change to identify key habitats and natural resource units that may need special management actions because of projected vulnerability, rarity, or importance to wildlife. The project outputs can also be used to predict which species will be most vulnerable to climate-induced changes and to develop landscape-level plans to conserve their populations and habitats.

Collaborators in this project are the University of Alaska, NOAA, US Fish and Wildlife Service, National Park Service, Alaska Bird Observatory Fairbanks, North Slope Borough Department of Wildlife Management Barrow, Alaska, and US National Forest Service.